

either hydrogen or nitrogen, neither of which combine with manganese, were employed. It is therefore evident that manganese does not resemble iron and nickel in forming a volatile compound with carbon monoxide, but that the volatility is a property of the element itself, and is singularly manifested even at the temperature of the melting point.

SOME of the more interesting captures recently made by the dredging staff of the Marine Biological Association at Plymouth are the Actinian *Chitonactis coronata*; the Nudibranchs *Berghia carulescens* (new to Britain), *Amphorina carulea*, and *Lamellidoris oblonga* in considerable numbers; and the handsomely marked rare spider-crab, *Stenorhynchus egyptius*. The alga *Halosiphia viridis* has been present in all townettings since October; and *Noctiluca*, though in small numbers, is now generally present. The breeding season of a large number of Invertebrata has already commenced, and the sea swarms with Copepod and Cirripede Nauplii, and with Polychæte larvæ. Species of the following genera are breeding:—The Hydroids *Halecium*, *Plumularia*, *Sertularella*, *Hydrallmania*; the Actinians *Chitonactis* and *Actinia*; the Nemertine *Lineus obscurus* (larva of Desor); *Phyllodoce maculata* and other Annelids; the Molluscs *Capulus hungaricus*, *Lamellaria*, *Buccinum*, *Purpura*, many Nudibranchs; and the Decapod Crustacea *Crangon*, *Pandalus*, and *Palemon*; *Carcinus*, *Cancer*, and *Eurynome*.

THE additions to the Zoological Society's Gardens during the past week include a Fallow Deer (*Dama vulgaris* ♂) European, presented by Mr. B. L. Rose; a Great Eagle Owl (*Bubo maximus*) European, presented by Mr. Adolphus Drucker; two Gold Pheasants (*Thaumalea picta* ♀ ♀) from China, presented by Miss Forster; nine Snow Buntings (*Plectrophenax nivalis*) British, presented by Mr. T. E. Gunn; an Egyptian Cobra (*Naia haje*), two Hoary Snakes (*Coronella cana*), from Victoria West, Cape Colony, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; three European Pond Tortoises (*Emys europæa*) European, deposited; a King Snake (*Coluber getulus*) from North America, received in exchange.

OUR ASTRONOMICAL COLUMN.

THE TOTAL SOLAR ECLIPSE OF APRIL 15-16, 1893.—The following particulars of the phenomena of the total solar eclipse of April 15-16, 1893, have been supplied to the Eclipse Committee by Mr. A. M. W. Downing, Superintendent of the *Nautical Almanac* office, for the use of the English observers at the eclipse stations to be occupied in Brazil and Africa:—

Brazil. Longitude 38° 50' W. Latitude 3° 20' S.

	d.	h.	m.	s.	Contact from N. point.	Contact from vertical.	Sun's alt. tude.
Eclipse begins	April 15	22	18	14	136° W.	19° W.	62°
Totality begins	15	23	40	51	Duration 4m. 43' 1s.		
Totality ends	15	23	45	34			
Eclipse ends	16	1	11	40	45° E.	84° W.	68°
Local mean times.							

Senegambia. Longitude 16° 30' W. Latitude 14° 15' N.

	d.	h.	m.	s.	Contact from N. point.	Contact from vertical.	Sun's alt. tude.
Eclipse begins	April 16	1	5	3	130° W.	156° E.	73°
Totality begins	16	2	27	59	Duration 4m. 12' 3s.		
Totality ends	16	2	32	12			
Eclipse ends	16	3	48	1	57° E.	24° W.	35°
Local mean times.							

REMARKABLE COMETS.—Bearing this title, Mr. Lynn has written a small book, in which he gives a short survey of the most interesting facts that have occurred in the history of cometary astronomy. As he remarks in the preface, the scope of the work is almost purely historical; but we are sure there are many who will peruse these few pages with great pleasure,

for the author has brought together these facts and presented them to the reader in a concise and plain style. We may mention that figures relating to elements of orbits, &c., are at a minimum, Mr. Lynn simply restricting himself to bare accounts. The author concludes by giving a list of the dates at which some of the comets may reappear, from which we make the following extract:—

Date.	...	Summer	...	Period in years.	...	Finlay's Comet
1893	...	Summer	...	6½	...	Encke's "
1894	...	Winter	...	3½	...	Faye's "
1896	...	Spring	...	7½	...	Brook's "
"	...	"	...	7	...	D'Arrest's "
1897	...	"	...	6½	...	Swift's "
"	...	"	...	5½	...	Winnecke's "
1898	...	Summer	...	5½	...	Wolf's "
"	...	Autumn	...	7	...	Comet of 1866
1899	...	Spring	...	33½	...	Tuttle's Comet
"	...	Summer	...	13½	...	Holmes's "
"	...	"	...	7	...	

The comet of 1866, as many of our readers well know, is identical with the meteoric stream through which we pass in November, so we hope that we shall be visited by a fine display.

COMET HOLMES (1892, III.).—Comet Holmes seems to have become somewhat dimmed during the past week, but we nevertheless give the ephemeris for the benefit of those who wish to follow it a little longer.

Ephemeris for 12h. M.T., Paris.

1893.	R.A. app.	Decl. app.
	h. m. s.	h. m. s.
Feb. 16	2 7 37.9	+34 14 30
17	9 15.3	16 42
18	10 53.2	18 58
19	12 31.5	21 16
20	14 10.3	23 37
21	15 49.5	26 1
22	17 29.1	28 26
23	2 19 9.2	34 30 54

COMET BROOKS (NOVEMBER 19, 1892).—This comet lies in the southernmost part of the constellation of Andromeda, just south of ε Andromedæ, and the following is the current ephemeris:—

Ephemeris for 12h. M.T., Berlin.

1893.	R.A. app.	Decl. app.	Log r.	Log Δ	Br.
	h. m. s.	h. m. s.			
Feb. 16	0 22 44	+26 46.9			
17	24 8	26 23.2	0.1343	0.2445	0.97
18	25 30	26 0.3			
19	26 50	25 38.3			
20	28 8	25 17.1			
21	29 23	24 56.7	0.1438	0.2711	0.83
22	30 37	24 37.1			
23	0 31 49	24 18.2			

RELATIVE POSITIONS OF STARS IN CLUSTER χ PERSEI.—Volume xxx. part iv. of the Transactions of the Royal Irish Society contains the results of the investigations of Sir Robert Ball and Mr. Arthur Rambaut, with respect to the relative positions of 223 stars in the cluster χ Persei as determined photographically. The instrument used throughout was a 15-inch silver on glass reflecting telescope, mounted according to Cook's standard equatorial pattern. For the adjustment of the plate (the size used here being 3¼ × 3¼) and mirror Dr. Johnstone Stoney's collimator was employed, this method ensuring the exact perpendicularity of the photographic plate to the axis of the collimator. The negatives were measured with an instrument made by the same firm, and after the same pattern as that used by Prof. Pritchard, at Oxford, this instrument being supplied with the means of measuring either rectangular or polar coordinates, the former of which has been adopted here throughout. In this memoir the authors treat in detail, by means of figures and formulæ, the equations for orientating the plate for measurement, for computing the differences in Right Ascension and Declination from the centre of the plate, for correcting the relative apparent positions of the stars for effects of separation, observation, nutation, and precession, &c. The measures here given have been obtained from one photograph taken with an exposure of ten minutes, the images under the microscope being susceptible "of very accurate measurement." That only

one negative has been employed is due, as the authors say, to pressure of other work and to necessary alterations in the instrument, but they hope to repeat the investigation next autumn. In the table showing the positions, the authors compare their results with those of Vogel and Pihl, and they find that a small difference, depending on the adopted position of the fundamental star, is apparent between the former's declinations, while Pihl's right ascensions differ slightly, though systematically, this discrepancy being due very probably to the different methods of determining the parallels. The memoir concludes with a map showing the relative positions of the stars plotted direct from the x and y coordinates.

L'ASTRONOMIE.—The February number of this journal contains many articles of interest. Prof. Stanislas Meunier gives an account of a meteorite that fell in Algeria; this meteorite has proved to be of iron, containing as much as 91·32 per cent., and a polished surface, when treated with an acid, showed the well-known Widmannstätten figures. M. Flammarion, in addition to an account of "Les Pierres Tombées du Ciel," with reference to "Les Anciens Volcans de la Lune," lately advocated by Prof. Coakley in *Astronomy and Astrophysics*, gives the fourth out of six chapters dealing with the question, "Comment Arrivera la fin du Monde." M. J. Fényi, director of the Observatory of Kalocsa, gives an account of the enormous solar eruption (383,000 kilometres high) that occurred on October 3 last, while a short note on some curious appearances undergone by comet Swift includes six drawings by M. Lorenzo Kropp, taken between March 18 and April 25, and the three photographs taken at the Lick Observatory by Mr. Barnard, all of which indicate the results of tremendous actions, whether they be due to the influences of different forces, "attraction, repulsion, chaleur, électricité, or changements d'état, qui agissent sur ses astres gazeux dans leur voisinage du soleil." M. Weinck of Prague describes the results of his examination of the Lick negatives with reference to the lunar crater Flammarion, and gives a drawing (which, by the way, can be well seen by half closing the eyes) of its surroundings, together with the three new craters. This number also includes a general summary of the meteorology of the preceding year, the results being given in diagrammatic form, bringing out clearly the diurnal and monthly changes.

JUPITER'S FIFTH SATELLITE.—Mr. Barnard, who has been continuing his observations with respect to the fifth satellite of Jupiter, communicates the results he has obtained to the *Astronomical Journal* (Nos. 285-86). The values of the elongation distances deduced from the measures at elongations are, for eastern elongation, $48^{\circ}08'9'' (\pm 0^{\circ}06'1'')$, and for western elongation, $47^{\circ}62'1'' (\pm 0^{\circ}17'6'')$, the probable errors of a single determination being $\pm 0^{\circ}23'$ and $\pm 0^{\circ}47'$ respectively. These values are equivalent to the following distances:—

E. elongation	112,500 $\pm$ 143 miles
W. " "	111,412 $\pm$ 412 " "

The values for the period he gives as

		h.	m.	s.
September 10–October 21	...	P = 11	57	23·72
September 10–October 28	...	P = 11	57	23·30
September 10–November 20	...	P = 11	57	22·73

the mean, when proportional weights are applied, being—

11h. 57m. 23·06s.

Among some other figures which Mr. Barnard gives are:—

Hourly motion	...	...	30°·111
Velocity in orbit	...	...	16·4 miles per second
Equatorial Hor. Par.	...	...	21" 51'
Distance from surface of Jupiter	...	...	67,000 miles (about).

While working at this satellite he has also been led to measure the equatorial and polar diameters of Jupiter himself, and the following numbers show the values he has deduced, the observations being made through smoked glass:—

Equatorial diameter	...	...	89,790 $\pm$ 65 miles
Polar	...	...	84,300 $\pm$ 80 miles

GEOGRAPHICAL NOTES.

THE *Times* Berlin correspondent furnishes some interesting notes of Dr. Baumann's recent journeys in the region of the Nile sources, which confirm Mr. Stanley's identification of the

Mountains of the Moon. In Urundi the kings were supposed to be lineal descendants of the moon, and the white traveller was hailed as being the returned ghost of a lately-deceased chief. On September 11 the expedition crossed the Akenyaru, which is not, as supposed, a lake, but a river, though the name "Nyanza" is often applied to it. Dr. Baumann also discovered that the so-called Lake Mworengo is in reality a river which flows into the Akenyaru, and came to the conclusion that there was no extensive sheet of water in Ruanda or North Urundi. On September 19 Dr. Baumann arrived at the source of the Kagera (Alexandra Nile), which rises at the foot of the precipitous and wooded hills which form the watershed between the basins of Rufizi and the Kagera. This mountain chain is known to the natives by the name of the "Mountains of the Moon," and is held in peculiar reverence by them. Here Dr. Baumann maintains the real source of the Nile to be, for if "it be acknowledged that the Kagera is the chief feeder of the Victoria Nyanza, it follows that the headwaters of the Nile can be none other than those of the Kagera itself in the Mountains of the Moon in Urundi, within the boundaries of German East Africa."

THE often-discussed scheme of an expedition to the North Pole by way of Franz Josef Land has been revived by Mr. F. G. Jackson, who proposes to lead an expedition next summer, if the means for equipping a ship are forthcoming. Mr. Jackson's plan is to travel with a small party, and establish a chain of depots northward from the most northerly accessible landing-place in Franz Josef Land. He would remain during winter in the most advanced post, and push on each summer with dog-sledges, until the pole is reached. The plan rests on the hypothesis of Franz Josef Land extending to the pole, just as Dr. Nansen's rests on the hypothesis of a transpolar current, but the evidence of the great extension of the land is not very satisfactory. Mr. Jackson's previous Arctic experience is not stated, nor is there any indication given as to whether he intends to travel at his own expense or to appeal for pecuniary help.

THE British South African Company have reserved the Zimbabwe Ruins and the area within a radius of one mile from the top of Zimbabwe Hill for archaeological and scientific purposes, and no settlements, farms, or mines will be permitted within that radius.

A BEAUTIFULLY illustrated report on the regulation of Swiss torrents, by the late M. de Salis, has recently been published by the Swiss Government. The natural erosion and surface change which go on at the present day so rapidly among the steep slopes of a mountainous country as to be frequently cataclysmic in their intensity, have to be avoided or endured in inhabited regions. A frequent source of floods is the damming up of a large river by the mud and stones brought down by a freshet in a small tributary. The method of combating this effect is to build a succession of weirs, and cut a parallel canal so that the sediment is caught and the overflow regulated before the escaping water reaches the main valley.

MR. MACKINDER's fourth Royal Geographical Society's educational lecture, delivered last week, dealt with Central Asian trade- and travel-routes, under the title of "The Gates of India and China."

TWENTY YEARS IN ZAMBESIA.

MR. F. C. SELOUS, the famous hunter and explorer of South Central Africa, gave a summary of his travels to the Royal Geographical Society on Monday evening. His address was illustrated by an exhibition of unusual interest in the tea-room, where a large collection of stuffed specimens of the characteristic African mammalian fauna was arranged. Photographs and various objects illustrative of the rapid development of Mashonaland since the Chartered Company took possession were also shown.

Mr. Selous commenced his African wanderings in 1871, and except for occasional visits to England he has travelled and traded in that continent ever since. In 1872 he and some companions penetrated into Matabeleland to hunt elephants, and had an amusing interview with the chief, Lo-Bengula. Although at that time not an explorer in the scientific sense, the accurate memory of his early wanderings over the country enabled Mr.